Goddard Procedures and Guidelines

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Title: GSFC Procedures and Guidelines for Electrostatic Discharge (ESD) Control of Electrostatic Discharge Sensitive (ESDS) Devices

P1. PURPOSE

The procedures and guidelines establish ESD Controls for ESDS devices that may be received, distributed, assembled, disassembled, handled, tested, repaired, or stored at the Component Technologies and Radiation Effects Branch Laboratories, Code 562. These measures are required during all phases of receiving, inspecting, assembling, disassembling, cleaning, testing, repairing, packaging, handling, storing, and shipping of all devices that are designated as ESD sensitive in the branch laboratory. These measures apply where invoked contractually in procurements or by the specific projects.

P2. APPLICABILITY

The procedures and guidelines define the requirements for an ESD Control Plan for all Code 562 laboratory work areas. The guidelines are intended to provide protection from damage and/or degradation caused by ESD.

P3. AUTHORITY

GPG 8730.3, NASA Quality Management System Policy (ISO 9000)

P4. REFERENCES

NASA-STD-8739.7, Requirements for Electrostatic Discharge Control

FAP P-303-840, Electrostatic Discharge Control Program

FAP P-303-841, ESD Training Requirements

FAP P-303-842, ESD Facilities Requirements

FAP P-303-843, Audit of ESD

DOD-HDBK-263, Electrostatic Discharge Control Handbook

P5. CANCELLATION

N/A

P6. RECORDS

Quality Records	Records Custodians	Retention
Records for each certification and audit for tracking compliance with ESD control plan	Branch Management Office	Retain for 2 years

P7. PROCEDURES

DEFINITIONS

a. Anti-static material – ESD protective material having a surface resistivity greater than 10^9 but not greater than 10^{12} ohms per square (FAP P-303-840).

b. Conductive material – ESD protective material having a surface resistivity of 10^5 ohms per square, maximum (FAP P-303-840).

c. Control area – All areas identified or designated to handle electrostatic discharge sensitive (ESDS) devices and equipped with electrostatic prevention measures.

d. Electrical Discharge (ED) – An instantaneous transfer of electrical power. Examples include a lightning strike or a large current spike when power is applied to large inductive power source such as building power supplies or magnetic motors or small current spikes when load high current of high voltage power supplies used for test equipment turn on.

e. Electrostatic charge – An electric charge on the surface of an object.

f. Electrostatic Discharge (ESD) – A transfer of electrostatic charge between bodies at different electrostatic potentials caused by direct contact or induced by an electrostatic field.

g. ESD Controlled Area – An area which is constructed and equipped with the necessary ESD protective materials and equipment to limit the ESD voltage below the sensitivity level of the ESD devices that are handled therein. The ESD Controlled areas will be labeled as such.

h. ESDS Devices – Term used to represent electronic parts (CMOS), etc.), subassemblies, assemblies, components, subsystem of a flight hardware package or related equipment, which may be damaged or the performance degraded by exposure to ESD.

i. Ground – A mass such as Earth or vehicle hull, capable of supplying or accepting a large electrical charge.

j. Ground fault circuit interrupter – A sensing device in series between electrical equipment and the electrical power source. The functions of the device are to sense leakage currents in faulty equipment or higher than normal rated currents for the circuit and to interrupt (break) the electrical circuit.

k. Ground Strap – A resistive (skin contact) wrist, leg, or ankle strap which is designed to rapidly dissipate personnel static charge safely.

l. Hard ground – A connection to ground either directly or through a low impedance (<100 ohms).

m. Soft ground – A connection to ground through an impedance sufficiently high to limit current flow to safe levels for personnel (normally 5 milliamperes). Impedance needed for a soft ground is dependent upon the voltage levels which could be contacted by personnel near the ground.

n. Handle or handling – Actions in which devices are hand manipulated or machine processed during actions such as inspections, manufacturing, assembling, cleaning, staging, testing, repairing, reworking, maintaining, installing, transporting, failure analysis, wrapping, packaging, marking or labeling.

o. Induction Polarization Charge (IPC) – The attracting or repelling of electrons on the surface of an object(e.g., circuit board) when the electrostatic field of a highly charged material (e.g., Styrofoam cup) is placed or moved close to the object.

p. Insulating Material – Material having surface resistivity greater than 10^{12} ohms per square (FAP P-303-840).

q. Protective Handling – Handling of ESDS devices in a manner to prevent damage from ESD.

r. Static Dissipating Material – ESD protective material which as a surface resistivity greater than 10^{5} ohms but not greater than 10^{9} ohms per square (FAP P-303-840).

s. Surface Resistivity – An inverse measure of the conductivity of a material and equal to the ratio of the potential gradient to the current per unit width of the surface, where the potential gradient is measured in the direction of the current flow in the material.

t. Triboelectric Charge – A surface generated, positive or negative charge formed when two similar or dissimilar materials are rubbed together or separated from each other.

u. Work Station – A non-static generating work bench, table, platform, etc. where ESD devices are handled in an ESD-controlled area.

P8 IMPLEMENTATION AND RESPONSIBILITIES

8.1 The branch will implement the ESD procedures and guidelines at the respective laboratory sites.

8.2 Certified personnel will be responsible for following actions and instructions which will Control the ESD program operations at the respective laboratory sites:

Actions

a. Establishing the ESD procedures and guidelines for conformance to the applicable work area.

b. Certifying the adequacy of the ESD-controlled areas and grounded stations prior to their use.

c. Ensuring the use of protective personnel clothing and proper personnel grounding at all locations where ESD devices are handled.

d. Ensuring that all personnel with access to ESD-controlled areas and/or who handled ESD devices have received the appropriate ESD-controlled training and have been certified after its completion in accordance with NASA-STD-8739.7 AND FAP P-303-841.

e. Perform audits to assure the integrity in the ESD-controlled areas is in accordance with the inspection listed in Table 1.

f. Verifying that all documentation (e.g., drawings, work instructions) contains ESD markings, precautions, and handling procedures as applicable.

g. Verifying that proper ESD marking labels (see FAP P-303-843, Exhibit A) are in place on ESD dissipation or shielding boxes/carriers/bags containing ESDS devices, printed circuit boards, or flight ready hardware with mounted ESDS devices.

h. Assuring that purchasing documentation includes ESD requirements.

i. Ensuring that all handling of ESDS devices is performed in ESD controlled areas.

j. Preparing and maintaining internal records of each certification and ensuring compliance with the ESD control program plan.

k. Providing internal reports and audits results.

l. Assuring that all deficiencies noted during audits or certification shall initiate corrective actions.

m. Updating the FAPP-303-840, ESD Control Plan.

n. Cognizant electrical engineers selected by the branch will be responsible for the initial setup of the ESD approved work stations.

Instructions

a. Training Requirements – All personnel with access to ESD-controlled areas who handle, package, store, or transport ESDS devices shall be certified in accordance with FAP P-303-841 and NASA-STD-8739.7. For other personnel with access to ESD – controlled areas who do not function in the above capacities, the training is not necessary; but these personnel must observe / or be made aware of the ESD requirements when in ESD – controlled areas.

b. Facilities ESD Control Requirements – All ESD certified personnel shall assure that all facilities that handle ESDS devices comply with ESD controls in accordance with FAP P-303-442,ESD Facilities Requirements.

c. Handling ESD Control Requirements – All ESD certified personnel shall assure that all ESD certified personnel handling ESDS devices comply with ESD controls in accordance with FAP P-303-843, Handling Requirements

d. ESD Audits – Only ESD certified personnel shall conduct audits of the facilities handling ESDS devices in accordance with FAP P-303-844, ESD Facilities Requirements and NASA-STD-8739.7.

e. Equipment Materials – All equipment used for protection from ESD shall require proof that verification was performed (i.e., labels, tags, or stickers).

Note: Above items that are not in compliance with current verification shall be refurbished or replaced and / or rendered unusable until corrective actions are complete.

Table 1 ESD Certification and Periodic Inspection Schedule (FAP P-303-840)

Subject	Initial	Each Work Shift	Semi-Annually	Annually
ESD surface resistivity And mats	X		X	
Work surface grounding	X			
Work surface static Charge dissipation	X			
Wrist strap continuity	X	X		
Facility earth grounding	X			
Temperature chambers	X			X
Soldering iron tip grounding	X			X

CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	12/21/2000	Initial Release